

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Holger AUCHTER et al.

Corres. to PCT/EP2003/012729

For: CLAMP FOR FASTENING AND CONNECTING TUBES

TRANSLATOR'S DECLARATION

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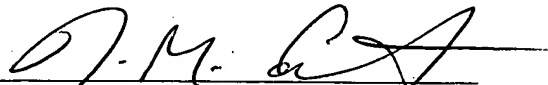
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I further declare that all statements made in this declaration of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of legal decisions of any nature based on them.

May 13, 2005

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Clamp for fastening and connecting tubes

5 The invention relates to a clamp for fastening and connecting tubes, in particular for fastening a junction tube on a heat exchanger in a motor vehicle.

10 Figures 5 to 7 show a conventional built-in clamp 101 which serves for connecting two tubes 102, 103 of a motor vehicle heat exchanger. One of the tubes 102 is provided at its end with a first flange 104. The other second tube 103, introduced slightly into the first tube 102, is provided, somewhat spaced apart from its  
15 end, with a periphery bead which forms a second flange 105 and which has a smaller outside diameter than the first flange 104. The clamp 101 is a stamped sheet-metal bent part which is designed symmetrically. The clamp 101 has a plurality of bent-round tabs 106 and  
20 two slots 107, running in the longitudinal direction of the clamp 101, in the end region 108 of the clamp 101, for positioning the clamp 101 and for pressing the two tubes 102, 103 together. To simplify assembly, the clamp 101 is provided in each case in the end region  
25 108 with an introduction slope 109. Furthermore, all the edges are rounded for easier handling. A clamp of this type can be handled easily, but still leaves much to be desired with regard to misuse, such as the clamp being inadvertently pulled off.

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The object of the invention is to make available an improved clamp for fastening and connecting tubes.

5 This object is achieved by means of a clamp having the features of claim 1. Advantageous refinements are the subject matter of the subclaims.

10 According to the invention, a clamp for fastening and connecting tubes is provided, in which at least one end region of the clamp is bent back. The clamp in this case surrounds the two tubes preferably pushed somewhat one into the other. The bent-back end region in this case preferably bears against the outer surface area of a flange of at least one of the tubes to be connected.

15 In spite of an introduction slope which is reduced, as compared with the prior art, the clamp can be attached to the prepositioned tubes and snapped in in a simple way. Since the end region projects outward to a lesser extent, the clamp cannot so easily be grasped and

20 removed, and it is therefore more reliable in terms of misuse. The end region of the bent-round end of the clamp is also supported on the flange or the bead of the tube and, in the attempt to remove the clamp, claws into the tube, so that it becomes more difficult to

25 remove the clamp.

Preferably, the clamp has a sharp edge in the back-bent end region, in particular in the bearing region against the flange. When the clamp snaps into its end position

30 during assembly, preferably a slight plastic deformation of the flange occurs due to the engagement of the sharp edge, that is to say the clamp "bites" firmly on the flange.

35 To increase reliability with regard to unauthorized removal, no or only a maximum of one outwardly projecting tab is provided on the clamp, so that it becomes more difficult to remove the clamp because of a

lack of possibilities for grasping it.

Preferably, the end regions of the clamp are bent back in such a way that they form approximately the shape of a rounded triangle, preferably none of the angles of the triangle being greater than  $90^\circ$ . Preferably, the triangle is approximately equilateral, that is to say all the angles lie in the range of about  $60^\circ \pm 10^\circ$ . The triangles are in this case formed in a plane perpendicular to the transverse axis.

Preferably, a slot, which runs in the longitudinal direction of the clamp, is provided in the region of at least one end region of the clamp. This slot receives at least one of the flanges, so that the clamp is correctly positioned. The slot preferably runs over two sides of the corresponding triangle, and it terminates approximately in the region of the radially outermost corner of the triangle.

Preferably, the clamp is designed essentially symmetrically with respect to a transverse axis, that is to say even an asymmetrically arranged element, for example a tab, may perfectly well be provided, but the end regions are designed mirror-symmetrically. In this case, in the built-in state, the transverse axis runs parallel to the longitudinal axis of the tubes to be connected and secured.

The invention is explained in detail below by means of an exemplary embodiment, with reference to the drawing in which:

fig. 1 shows a view of a clamp according to the invention,

fig. 2 shows a view of the clamp of fig. 1 in the built-in state,

- fig. 3 shows a top view, illustrated in simplified form, of a built-in clamp according to fig. 2,
- 5 fig. 4 shows a view of a detail of the clamp of fig. 1, illustrated in a central section,
- fig. 5 shows a clamp according to the prior art in a view corresponding to fig. 1,
- 10 fig. 6 shows a view of the conventional clamp of fig. 1 in the built-in state, and
- fig. 7 shows a top view, illustrated in simplified form, of the built-in conventional clamp
- 15 according to fig. 6.

A clamp 1 according to the invention, such as is illustrated in figures 1 to 4, serves particularly for

20 connecting two tubes 2 and 3 or one tube to a junction of a motor vehicle heat exchanger. In this case, according to the prior art, one of the tubes 2 is provided at its end with a first flange 4, and the other second tube 3 introduced slightly into the first

25 tube 2 is provided, somewhat spaced apart from this end, with a periphery bead which forms a second flange 5 and which has a smaller outside diameter of the first flange 4.

30 The clamp 1 is designed essentially symmetrically with respect to the transverse axis. In this case, in the built-in state, the transverse axis runs parallel to the longitudinal axis of the tubes 2, 3 to be connected and secured. The clamp 1 has a plurality of tabs 6

35 which are bent round and serve for positioning and fixing the tubes 2, 3. Furthermore, designed symmetrically with respect to the transverse axis, two slots 7 running in the longitudinal direction of the

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clamp 1 are provided in the two end regions 8 of the clamp 1. These slots 7 surround the first flange 4 and serve for positioning and fixing the clamp 1 with respect to the tube 2.

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On account of this symmetrical design, only one end region 8 of the clamp 1 is described below.

As is evident from fig. 4, the end region 8 of the clamp 1 is bent back. In this case, the end region 8 forms approximately the shape of a rounded right-angled triangle. The slot 7 in this case runs over two of the three triangle sides and terminates approximately in the radially outermost corner. The end 10 of the clamp 1 is bent round to the extent such that it bears with an edge against the flange 4 (cf. fig. 3). In this case, the edge has a sharp configuration, so that, during assembly, plastic deformations of the flange 4 may occur and the clamp 1 "bites firmly". However, for easier handling, the other edges of the clamp 1 are rounded.

To simplify assembly, a slight introduction slope 9 is provided on the radially inner side of the triangle formed by the end region 8.

For assembly, the tubes 2 and 3 are positioned and the clamp 1 is pushed over them in the manner of a clip. As illustrated in fig. 3, to verify the connection, the pull-off force is checked by means of a mandrel 11.

**List of reference symbols**

|    |        |                    |
|----|--------|--------------------|
|    | 1, 101 | Clamp              |
| 5  | 2, 102 | Tube               |
|    | 3, 103 | Tube               |
|    | 4, 104 | Flange             |
|    | 5, 105 | Flange             |
|    | 6, 106 | Tab                |
| 10 | 7, 107 | Slot               |
|    | 8, 108 | End region         |
|    | 9, 109 | Introduction slope |
|    | 10     | End                |
|    | 11     | Mandrel            |
| 15 |        |                    |